**WHAT IS CLAIMED IS**:

1. An activated carbon comprising:

5      a pore volume per gram of said activated carbon more than about 0.32 mL in the pore width range between about 4 to 63 angstroms; and a pore volume per gram of said activated carbon more than about 0.21 mL in the pore width range between about 63 to 500 angstroms; provided that the pore volume per gram of said activated carbon in the pore width range of about 20 to 63 angstroms is at least about 25% of the total pore volume

10 per gram of said activated carbon in said pore width range of 4 to 63 angstroms, as measured per the Argon Adsorption Density Functional Theory protocol and provided that said activated carbon exhibits a pH equal to or greater than 9.9, when immersed as a slurry in nitrogen-purged deionized distilled water, while the slurry contains about 10% by weight of

15 activated carbon, as measured per the Slurry pH protocol.

2. The activated carbon according to claim 1, wherein an activated carbon contactor comprising grains of said activated carbon is capable of removing about 12,000 bed volumes or greater of $^{14}$C-methylisoborneol

20 down to below 10 parts per trillion of water having about 3.5 mg/L or greater of organic matter as total organic carbon as monitored per the Standardized Mini-Column MIB Adsorber protocol.

3. The activated carbon according to claim 1 where said activated carbon is

25 capable of removing about 7500 bed volumes of $^{14}$C-MIB down to 4 parts per trillion of water having about 3.5 mg/L or greater organic mater as total organic carbon as monitored per the Standardized Mini-Column MIB Adsorber protocol.

30 4. The activated carbon according to claim 1, wherein said activated carbon exhibits a mobility-based zeta potential at a pH of 10.5 that does not

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change ± more than 3 mV between the time that said activated carbon is exposed for about 1 hour and about 24 hours to deionized distilled water through which an excess of gaseous oxygen is bubbled, as measured per the Mobility-Based Zeta Potential protocol.

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5.    The activated carbon according to claim 1, wherein said activated carbon exhibits a mobility-based zeta potential at a pH of 10.5 that does not change ± more than 17 mV between the time that said activated carbon is exposed for about 1 hour and about 24 hours to deionized distilled water through which an excess of gaseous oxygen is bubbled, as measured per the Mobility-Based Zeta Potential protocol.

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6.    The activated carbon according to claim 1 wherein said activated carbon is derived from coal.

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7.    The activated carbon according to claim 1 wherein said activated carbon removes natural organic matter.

8.    The activated carbon according to claim 1 wherein said activated carbon removes methyl tert butyl ether, chlorinated organic compounds, aliphatic organic compounds, aromatic organic compounds, and/or mixtures thereof.

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9.    A method for producing activated carbon comprising:

25          heating a carbonaceous material to a temperature in the range between about 300 to 1400 °C for a period of time in the range between about 0.1 to 500 minutes in the presence of at least one gas selected from the group consisting of: steam, hydrogen, methane and/or natural gas, and mixtures thereof, provided that the mass ratio of at least one of these said

30          gases to initial activated carbon is greater than about the following: 0.7 grams said steam: 1.0 grams initial dry carbonaceous material, and/or 0.35

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grams said methane and/or natural gas: 1.0 grams initial dry carbonaceous material, and/or 0.35 grams said hydrogen: 1.0 grams initial dry carbonaceous material.

10.    The method according to claim 9 wherein said activated carbon comprises: a pore volume per gram of said activated carbon more than about 0.32 mL in the pore width range between about 4 to 63 angstroms; and a pore volume per gram of said activated carbon more than about 0.21 mL in the pore width range between about 63 to 500 angstroms; provided that the pore volume per gram of said activated carbon in the pore width range of about 20 to 63 angstroms is at least about 25% of the total pore volume per gram of said activated carbon in said pore width range of 4 to 63 angstroms, as measured per the Argon Adsorption Density Functional Theory protocol, provided that said activated carbon exhibits a pH equal to or greater than about 9.9, when immersed as a slurry in nitrogen-purged deionized distilled water, while the slurry contains about 10% by weight of activated carbon, as measured per the Slurry pH protocol.

11.    The method according to claim 9, wherein an activated carbon contactor comprising grains of said activated carbon is capable of removing greater than 10,000 bed volumes of ^{14}C-methylisoborneol down to below 10 parts per trillion of water having about 2.0 mg/L or greater of organic matter as total organic carbon, as mentioned per the Standardized Mini-Column MIB Adsorber protocol.

12.    The method according to claim 9, wherein said activated carbon is capable of removing greater than 7500 bed volumes of ^{14}C-MIB down to 4 parts per trillion of water having about 2.0 mg/L or greater organic matter as total organic carbon, as monitored per the Standardized Mini-Column MIB Adsorber protocol.

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13.    The method according to claim 9, wherein said activated carbon exhibits a mobility-based zeta potential at a pH of 10.5 that does not change ± more than 3 mV between the time that said activated carbon is exposed for about 1 hour and about 24 hours to deionized distilled water through which an excess of gaseous oxygen is bubbled, as measured per the Mobility-Based Zeta Potential protocol.

14.    The method according to claim 9, wherein said activated carbon exhibits a mobility-based zeta potential at a pH of 10.5 that does not change ± more than 17 mV between the time that said activated carbon is exposed for about 1 hour and about 24 hours to deionized distilled water through which an excess of gaseous oxygen is bubbled, as measured per the Mobility-Based Zeta Potential protocol.

15.    A method for modifying activated carbon comprising:

heating said activated carbon to a temperature in the range between about 300 to 1400 °C for a period of time in the range between about 0.1 to 500 minutes in the presence of at least one gas selected from the group consisting of: steam, hydrogen, methane and/or natural gas, and mixtures thereof, provided that the mass ratio of at least one of these said gases to initial activated carbon is greater than about the following: 0.7 grams said steam: 1.0 grams initial dry activated carbon, and/or 0.35 grams said methane and/or natural gas: 1.0 grams initial dry activated carbon, and/or 0.35 grams said hydrogen: 1.0 grams initial dry activated carbon.

16.    The method according to claim 15 wherein said activated carbon comprises:

a pore volume per gram of said activated carbon more than about 0.32 mL in the pore width range between about 4 to 63 angstroms; and a pore volume per gram of said activated carbon more than about 0.21 mL in the pore width range between about 63 to 500 angstroms; provided that the

pore volume per gram of said activated carbon in the pore width range of about 20 to 63 angstroms is at least about 25% of the total pore volume per gram of said activated carbon in said pore width range of 4 to 63 angstroms, as measured per the Argon Adsorption Density Functional

5        Theory protocol, provided that said activated carbon exhibits a pH equal to or greater than about 9.0, when immersed as a slurry in nitrogen-purged deionized distilled water, while the slurry contains about 10% by weight of activated carbon, as measured per the Slurry pH protocol.

10   17.    The method according to claim 15, wherein an activated carbon contactor comprising grains of said activated carbon is capable of removing greater than 7000 bed volumes of $^{14}$C-methylisoborneol down to below 10 parts per trillion of water having about 2.0 mg/L or greater of organic matter as total organic carbon, provided that said activated carbon is capable of

15       removing greater than 4500 bed volumes of $^{14}$C-MIB down to 4 parts per trillion of water having about 2.0 mg/L or greater organic mater as total organic carbon as monitored per the Standardized Mini-Column MIB Adsorber test protocol.

20   18.    The method according to claim 15 wherein said activated carbon exhibits a mobility-based zeta potential at a pH of 10.5 that does not change ± more than 3 mV between the time that said activated carbon is exposed for about 1 hour and about 24 hours to deionized distilled water through which an excess of gaseous oxygen is bubbled, as measured per the

25       Mobility-Based Zeta Potential protocol.

     19.    The method according to claim 15 wherein said activated carbon exhibits a mobility-based zeta potential at a pH of 10.5 that does not change ± more than 17 mV between the time that said activated carbon is exposed for

30       about 1 hour and about 24 hours to deionized distilled water through

which an excess of gaseous oxygen is bubbled, as measured per the Mobility-Based Zeta Potential protocol.

20.     The method of claim 15 wherein said activated carbon is lignite-based activated carbon.

21.     A method for treating water comprising:

passing said water over an activated carbon that comprises: a pore volume per gram of said activated carbon more than about 0.32 mL in the pore width range between about 4 to 63 angstroms; and a pore volume per gram of said activated carbon more than about 0.21 mL in the pore width range between about 63 to 500 angstroms; provided that the pore volume per gram of said activated carbon in the pore width range of about 20 to 63 angstroms is at least about 25% of the total pore volume per gram of said activated carbon in said pore width range of 4 to 63 angstroms, as measured per the Argon Adsorption Density Functional Theory protocol, provided that said activated carbon has a pH equal to or greater than about 9.9, when immersed as a slurry in nitrogen-purged deionized distilled water, while the slurry contains about 10% by weight of activated carbon, as measured per the Slurry pH protocol.

22.     The method according to claim 21, wherein said activated carbon, when placed in a full-scale contactor or filter-bed adsorber will remove greater than 9500 bed volumes of methylisoborneol down to below 10 parts per trillion of water having about 1.5 mg/L or more of organic matter as total organic carbon, provided that the empty bed contact time is about 7.5 minutes or less.

23.     The method according to claim 21, wherein said activated carbon, when placed in a full-scale contactor or filter-bed adsorber will remove greater than 11,000 bed volumes of methylisoborneol down to below 10 parts per trillion of water having about 1.5 mg/L or more of organic matter as total

organic carbon, provided that the empty bed contact time is more than about 7.5 minutes.

24.     The method according to claim 21, wherein said activated carbon exhibits a mobility-based zeta potential at a pH of 10.5 that does not change ± more than 3 mV between the time that said activated carbon is exposed for about 1 hour and about 24 hours to deionized distilled water through which an excess of gaseous oxygen is bubbled, as measured per the Mobility-Based Zeta Potential protocol.

25.     The method according to claim 21, wherein said activated carbon exhibits a mobility-based zeta potential at a pH of 10.5 that does not change ± more than 17 mV between the time that said activated carbon is exposed for about 1 hour and about 24 hours to deionized distilled water through which an excess of gaseous oxygen is bubbled, as measured per the Mobility-Based Zeta Potential protocol.

26.     An activated carbon prepared from the method comprising:
        heating a carbonaceous material to a temperature in the range between about 300 to 1400 °C for a period of time in the range of about 0.1 to 500 minutes, thereby forming said activated carbon then washing said activated carbon with an acid that has a molarity greater than about $10^{-4}$ M, then heating acid washed activated carbon to a temperature in the range between about 300 to 1400 °C for a period of time between about 0.1 to 500 minutes, in the presence of at least one gas selected from the group consisting of: steam, methane, natural gas, hydrogen, nitrogen, ammonia, benzene, propane, and mixtures thereof.

27.     The activated carbon according to claim 26, wherein said gas is steam and said steam to initial dry activated carbon ratio is greater than about 0.3:1.0.

28.  The activated carbon according to claim 26, wherein said gas is methane and/or natural gas, or a mixture thereof, and said methane and/or natural gas to initial dry activated carbon ratio is greater than about 0.1:1.0.

5  29.  The activated carbon of claim 26 where said gas is hydrogen, and said hydrogen to initial dry activated carbon ratio is greater than about 0.1:1.0.

30.  The activated carbon according to claim 26 wherein said activated carbon comprises:

10  a pore volume per gram of said activated carbon more than about 0.25 mL in the pore width range between about 4 to 63 angstroms; and a pore volume per gram of said activated carbon more than about 0.15 mL in the pore width range between about 63 to 500 angstroms; as measured per the Argon Adsorption Density Functional Theory protocol, provided that

15  said activated carbon has a pH equal to or greater than 9.0, when immersed as a slurry in nitrogen-purged deionized distilled water, while the slurry contains about 10% by weight of activated carbon, as measured per the Slurry pH protocol.

20  31.  The activated carbon according to claim 26, wherein an activated carbon contactor comprising grains of said activated carbon is capable of removing greater than 6500 bed volumes of $^{14}$C-methylisoborneol down to below 10 parts per trillion of water having about 2.0 mg/L or greater of organic matter as total organic carbon, provided that said activated carbon

25  is capable of removing greater than 2600 bed volumes of $^{14}$C-MIB down to 4 parts per trillion of water having about 2.0 mg/L or greater organic matter as total organic carbon as monitored per the Standardized Mini-Column MIB Adsorber protocol.

30  32.  The activated carbon according to claim 26, wherein said activated carbon exhibits a mobility-based zeta potential at a pH of 10.5 that does not

change ± more than 5 mV between the time that said activated carbon is exposed for about 1 hour and about 24 hours to deionized distilled water through which an excess of gaseous oxygen is bubbled, as measured per the Mobility-Based Zeta Potential protocol.

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33.    The activated carbon according to claim 26, wherein said activated carbon exhibits a mobility-based zeta potential at a pH of 10.5 that does not change ± more than 20 mV between the time that said activated carbon is exposed for about 1 hour and about 24 hours to deionized distilled water through which an excess of gaseous oxygen is bubbled, as measured per the Mobility-Based Zeta Potential protocol.

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34.    The activated carbon according to claim 26, wherein said activated carbon is used to adsorb molecules comprising: natural organic matter, methyl tert butyl ether, chlorinated organic compounds, aromatic organic compounds, and aliphatic organic compounds, and/or mixtures thereof.

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